

AMEC FOSTER WHEELER
BUNKER HILL CENTRAL TREATMENT PLANT UPGRADE PROJECT
Kellogg, Idaho

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DATA VALIDATION REPORT

Bunker Hill Central Treatment Plant

Kellogg, Idaho

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TABLE OF CONTENTS

	Page
ACRONYMS	iii
1.0 INTRODUCTION	1
2.0 DATA VALIDATION METHODOLOGY	1
3.0 EXPLANATION OF DATA QUALITY INDICATORS	2
3.1 Laboratory Control Sample Recoveries	2
3.2 Matrix Spike Recoveries.....	3
3.3 Blank Concentrations	3
3.4 Laboratory Duplicates	3
4.0 DEFINITIONS OF QUALIFIERS THAT MAY BE ADDED DURING DATA VALIDATION	4
5.0 QUALIFICATION REASON CODES.....	4
6.0 CHAIN OF CUSTODY AND SAMPLE RECEIPT CONDITION DOCUMENTATION	4
7.0 SPECIFIC DATA VALIDATION FINDINGS.....	4
7.1 Metals By EPA Method 200.7.....	5
7.1.1 Holding Times	5
7.1.2 Initial and Continuing Calibration Verification	5
7.1.3 Initial and Continuing Calibration Blanks.....	5
7.1.4 Laboratory, Equipment, and Trip Blanks.....	5
7.1.5 Laboratory Control Sample Accuracy and Precision	5
7.1.6 Laboratory Duplicates.....	5
7.1.7 Matrix Spikes/Matrix Spike Duplicates	6
7.1.8 Analytical Sensitivity	6
7.1.9 Data Reporting and Analytical Procedures	6
7.2 Total Suspended Solids by SM 2540D	7
7.2.1 Holding Times	7
7.2.2 Laboratory Blanks.....	7
7.2.3 Laboratory Control Sample Accuracy and Precision	7
7.2.4 Laboratory Duplicates.....	7
7.2.5 Analytical sensitivity.....	7
7.2.6 Data Reporting and Analytical Procedures	7
7.3 pH by SM 4500 H-B	8
7.3.1 Holding Times	8
7.3.2 Laboratory Control Sample Accuracy	8
7.3.3 Laboratory Duplicates.....	8
7.3.4 Data Reporting and Analytical Procedures	8
8.0 FIELD DUPLICATES	8
9.0 SUMMARY AND CONCLUSIONS.....	8
REFERENCES.....	10
LIMITATIONS.....	11

TABLES

Table 1	Field Samples Submitted to SVL Analytical, Inc.
Table 2	Qualifiers Added During Data Validation
Table 3	Field Duplicate Detections

ACRONYMS

%	percent
Amec Foster Wheeler	Amec Foster Wheeler Environment & Infrastructure, Inc.
CCB	continuing calibration blank
CCV	continuing calibration verification
CLP	Contract Laboratory Program
COC	chain of custody
DL	detection limit
EPA	United States Environmental Protection Agency
ICAL	initial calibration
ICV	initial calibration verification
ID	identification
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
MS	matrix spike
MSD	matrix spike duplicate
QC	quality control
RL	reporting limit
RPD	relative percent difference
SAP	sampling and analysis plan
SM	Standard Method
SVL	SVL Analytical Inc.
TSS	total suspended solids

DATA VALIDATION REPORT

Bunker Hill Central Treatment Plant

Kellogg, Idaho

1.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler) collected 32 water samples (including 4 field duplicates, a trip blank, and an equipment blank) between May 21 and June 29, 2018 from the Bunker Hill Central Treatment Plant in Kellogg, Idaho. Amec Foster Wheeler submitted the samples to SVL Analytical Inc. (SVL), located in Coeur D'Alene, Idaho, where they were assigned to sample delivery groups X8E0481, X8E0653, X8F0001, X8F0022, X8F0023, X8F0082, X8F0169, X8F0209, X8F0210, X8F0261, X8F0342, X8F0377, X8F0378, X8F0430, X8F0513, X8F0543, X8F0600, and X8F0686. SVL analyzed the samples for total metals by United States Environmental Protection Agency (EPA) Method 200.7, total suspended solids (TSS) by Standard Methods for the Examination of Water and Wastewater (SM) 2540D, and pH by SM 4500-H B. A list of these samples by field sample identification (ID), sample collection date, and the laboratory sample IDs is presented in Table 1.

2.0 DATA VALIDATION METHODOLOGY

Amec Foster Wheeler performed Stage 4 validation on samples KT-06-04-18, KT-06-07-18, PTM-06-07-18, and QC-06-07-18. The Stage 4 validation includes review and recalculation of the laboratory's analytical report and the raw analytical data. The remainder of the data underwent EPA Stage 2B validation, which includes review of sample- and instrument-specific quality control (QC) samples on data summary forms, but does not include review or validation of the raw analytical data. This data validation has been performed in general accordance with:

- Amec Foster Wheeler, 2017. Operations & Maintenance Services Sampling and Analysis Plan (SAP), Bunker Hill Central Treatment Plant Upgrade Project, Kellogg, Idaho, March 2017.
- EPA, 2017. EPA Contract Laboratory Program (CLP) National Functional Guidelines for Inorganic Superfund Data Review, EPA-540 R 017 001.
- The analytical methods referenced by the laboratory.

The laboratory's certified analytical report and supporting documentation were reviewed to assess the following:

- Data package and electronic data deliverable completeness;
- Chain-of-custody (COC) compliance;
- Sample Receipt;
- Holding time compliance;
- Initial calibration (ICAL), initial calibration verification (ICV), and continuing calibration verification (CCV) compliance with method specified criteria;
- Presence or absence of laboratory contamination as demonstrated by calibration and laboratory blanks;
- Accuracy and bias as demonstrated by recovery of surrogate spikes, laboratory control sample (LCS), and matrix spike (MS) samples;
- Analytical precision as relative percent difference (RPD) of analyte concentration between laboratory duplicates, LCSs/LCS duplicates (LCSs), or MS/MS duplicates (MSDs);
- Sampling and analytical precision as RPD of analyte concentration between field duplicates;
- Internal standard and surrogate compound recoveries;
- Analyte identification and quantification verification from raw analytical data (Stage 4 validation only); and
- Insofar as possible, the degree of conformance to method requirements and good laboratory practices.

3.0 EXPLANATION OF DATA QUALITY INDICATORS

Summary explanations of the specific data quality indicators reviewed during data validation are presented below.

3.1 LABORATORY CONTROL SAMPLE RECOVERIES

LCSs are aliquots of analyte free matrices that are spiked with the analytes of interest for an analytical method, or a representative subset of those analytes. The spiked matrix is then processed through the same analytical procedures as the samples they accompany. LCS recovery is an indication of a laboratory's ability to successfully perform an analytical method in an interference free matrix.

3.2 MATRIX SPIKE RECOVERIES

MSs and MSDs are prepared by adding known amounts of the analytes of interest for an analytical method, or a representative subset of those analytes, to an aliquot of sample. The spiked sample is then processed through the same extraction, concentration, cleanup, and analytical procedures as the unspiked samples in an analytical batch.

MS recovery and precision are an indication of a laboratory's ability to successfully recover an analyte in the matrix of a specific sample or closely related sample matrices. It is important not to apply MS results for any specific sample to other samples without understanding how the sample matrices are related.

3.3 BLANK CONCENTRATIONS

Blank samples are aliquots of analyte free matrix that are used as negative controls to verify that the sample collection, storage, preparation, and analysis system does not produce false positive results.

Laboratory blanks are processed by the laboratory using exactly the same procedures as the field samples. Target analytes should not be found in laboratory blanks.

Equipment blanks are prepared by passing analyte free water through or over sample collection equipment and collecting the water in sample containers. Equipment blanks are used to monitor for possible sample contamination during the sample collection process and serve as a check on the effectiveness of field decontamination procedures.

Trip blanks are vials of analyte free water that accompany sample bottles shipped to the field and back to the laboratory with field samples. Trip blanks assess contamination attributed to shipping and handling procedures, as well as contamination from containers. Target analytes should not be found in trip blanks.

Target analytes should not be found in laboratory blanks. When target analytes are detected in blanks, analyte concentrations in associated samples less than 5 times the concentration detected in the blank will be U qualified as being not detected.

3.4 LABORATORY DUPLICATES

Laboratory duplicate analysis verifies acceptable method precision by the laboratory at the time of preparation and analysis and/or sampling precision at the time of collection.

4.0 DEFINITIONS OF QUALIFIERS THAT MAY BE ADDED DURING DATA VALIDATION

- J** The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- R** The sample result is rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
- U** The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
- UJ** The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

5.0 QUALIFICATION REASON CODES

The following reason codes were applied to the data during data validation:

- DL** The analyte concentration is between the detection limit (DL) and the reporting limit (RL).
- HT** The EPA-recommended maximum holding time was exceeded.

6.0 CHAIN OF CUSTODY AND SAMPLE RECEIPT CONDITION DOCUMENTATION

The samples were received at the laboratory under proper COC, intact, properly preserved, and at temperatures less than the SAP-specified maximum of 6 degrees Celsius.

7.0 SPECIFIC DATA VALIDATION FINDINGS

Results from these samples may be considered usable with the limitations and exceptions described in Sections 7.1 through 8.0. Qualifiers added during validation are summarized in Table 2.

7.1 METALS BY EPA METHOD 200.7

Total metals results generated by SVL may be considered usable with the limitations described in Sections 7.1.1 through 7.1.9.

7.1.1 Holding Times

All samples were analyzed for metals within the SAP-specified maximum holding of 180 days.

7.1.2 Initial and Continuing Calibration Verification

ICV and CCV recoveries were within method-specified limits.

7.1.3 Initial and Continuing Calibration Blanks

Target analytes were not detected in the initial calibration blanks and continuing calibration blanks (CCBs), with the following exception:

7.1.4 Laboratory, Equipment, and Trip Blanks

Target analytes were not detected in the laboratory, equipment, and trip blanks associated with the analysis of these samples, with the following exception:

- Zinc was detected at a concentration of 0.006 milligrams per liter in the equipment blank associated with samples KT-06-11-18 and QC-06-11-18. Zinc was detected in samples KT-06-11-18 and QC-06-11-18 at concentrations greater than five times the concentration detected in the blank, and data usability is not adversely affected by the blank detection.

7.1.5 Laboratory Control Sample Accuracy and Precision

LCS and LCSD recoveries were within the SAP-specified limits and RPDs between the LCS and LCSD results were less than the SAP-specified maximum of 20%.

7.1.6 Laboratory Duplicates

SVL performed duplicate analyses on project samples KT-05-21-15, KT-05-28-18, 006-06-01-18, 006-06-04-18, PTM-06-07-18, 006-06-06-18, 006-06-08-18, 006-06-11-18, 006-06-13-18, 006-06-15-18, 006-06-18-18, 006-06-20-18, TB-06-11-18, PTM-06-21-18, 006-06-22-18, 006-06-25-18, 006-06-27-18, and 006-06-29-18. RPDs between source and duplicate results were less than the SAP-specified maximum of 20%, with the following exception:

- The RPD between lead results was high at 39.5% in the duplicate analysis performed on sample PTM-06-07-18. The difference between primary and duplicate results was less than the RL, demonstrating acceptable analytical precision.

7.1.7 Matrix Spikes/Matrix Spike Duplicates

SVL performed MS and MSD analyses on project samples KT-05-21-15, KT-05-28-18, 006-06-01-18, 006-06-04-18, PTM-06-07-18, 006-06-06-18, 006-06-08-18, 006-06-11-18, 006-06-13-18, 006-06-15-18, 006-06-18-18, 006-06-20-18, TB-06-11-18, PTM-06-21-18, 006-06-22-18, 006-06-25-18, 006-06-27-18, and 006-06-29-18 for total metals. MS/MSD recoveries were within SAP-specified limits and RPDs between MS and MSD results were less than the SAP-specified maximum of 20%, with the following exceptions:

- Manganese (374%, MSD) and zinc (175%, 893%) recoveries were high in the MS and/or MSD performed on sample KT-05-21-15. Manganese and zinc were detected in the native unspiked sample at concentrations greater than four times the matrix spike, and data usability cannot be evaluated based on the performance of these analytes in this sample.
- Manganese (151%, MS) and zinc (290%, -68.0%) recoveries were outside the SAPP-specified limits in the MS and/or MSD performed on sample KT-05-28-18. Manganese and zinc were detected in the native unspiked sample at concentrations greater than four times the matrix spike, and data usability cannot be evaluated based on the performance of these analytes in this sample.
- Zinc recoveries were low at 64.9% and 68.2%, respectively, in the MS and MSD performed on sample PTM-06-07-18. Zinc was detected in the native unspiked sample at a concentration greater than four times the matrix spikes, and data usability cannot be evaluated based on the performance of this analyte in this sample.
- Manganese recovery was low at 61.8% in the MS performed on sample 006-06-15-18. Manganese was detected in the native unspiked sample at a concentration greater than four times the matrix spike, and data usability cannot be evaluated based on the performance of this analyte in this sample.

7.1.8 Analytical Sensitivity

Amec Foster Wheeler compared RLs for cadmium, lead, manganese, and zinc against applicable discharge limits to confirm that the RLs were sufficiently low to meet the discharge limits. Non-detect results were reported to RLs less than the applicable discharge limits.

7.1.9 Data Reporting and Analytical Procedures

SVL J qualified analytes with concentrations between the DL and the RL. Amec Foster Wheeler agrees that these results are quantitatively uncertain and has maintained SVL's J qualifiers. (J-DL)

7.2 TOTAL SUSPENDED SOLIDS BY SM 2540D

TSS results generated by SVL may be considered usable with the limitations described in Sections 7.2.1 through 7.2.6.

7.2.1 Holding Times

All samples were analyzed for TSS within the SAP-specified maximum holding time of 7 days.

7.2.2 Laboratory Blanks

TSS was not detected in the laboratory blanks associated with the analysis of these samples.

7.2.3 Laboratory Control Sample Accuracy and Precision

LCS and LCSD recoveries were within the laboratory-specified 90 to 110% limits and RPDs between the LCS and LCSD results were less than the laboratory-specified maximum of 10%.

7.2.4 Laboratory Duplicates

SVL performed duplicate analyses on project samples 006-06-01-18, 006-06-04-18, 006-06-06-18, 006-06-08-18, 006-06-11-18, 006-06-13-18, 006-06-15-18, 006-06-18-18, 006-06-20-18, 006-06-25-18, 006-06-27-18, and 006-06-29-18. RPDs between source and duplicate results were less than laboratory-specified maximum of 10%, with the following exception:

- RPDs between TSS results were high in the duplicate analyses performed on samples 006-06-06-18 (73.7%), 006-06-22-18 (10.5%), and 006-06-29-18 (22.2%). In these cases, the differences between primary and duplicate results were less than the RL, demonstrating acceptable analytical precision.

7.2.5 Analytical sensitivity

Amec Foster Wheeler compared RLs for TSS against applicable discharge limits to confirm that the RLs were sufficiently low to meet the discharge limits. Non-detect results were reported to RLs less than the applicable discharge limits.

7.2.6 Data Reporting and Analytical Procedures

SVL J qualified analytes with concentrations between the DL and the RL. Amec Foster Wheeler agrees that these results are quantitatively uncertain and has maintained SVL's J qualifiers. (J-DL)

7.3 PH BY SM 4500 H-B

pH results generated by SVL may be considered usable with the limitations described in Sections 7.3.1 through 7.3.4.

7.3.1 Holding Times

All field samples were analyzed for pH after the EPA-recommended maximum hold time of 15-minutes from sample collection. Amec Foster Wheeler J qualified the pH results from these samples because of the missed hold times. (J-HT)

7.3.2 Laboratory Control Sample Accuracy

LCS recoveries were within the laboratory-specified 98.5 to 101.5% limits.

7.3.3 Laboratory Duplicates

SVL performed duplicate analyses on samples 006-06-01-18, 006-06-04-18, 006-06-06-18, 006-06-08-18, 006-06-11-18, 006-06-13-18, 006-06-15-18, 006-06-18-18, 006-06-20-18, 006-06-22-18, 006-06-25-18, 006-06-27-18, and 006-06-29-18. RPDs between source and duplicate results were less than laboratory-specified maximum of 5%.

7.3.4 Data Reporting and Analytical Procedures

There were no anomalies associated with the pH analysis of these samples.

8.0 FIELD DUPLICATES

Field duplicates were collected with samples: KT-05-24-18 (QC-05-24-18), PTM-06-07-18 (QC-06-07-18), KT-06-11-18 (QC-06-11-18), and 006-06-22-18 (QC-06-22-18). Target analyte detections are summarized in Table 3. Precision values were less than the SAP-specified maximum of 30%, or the differences between detected concentrations were less than the RL, demonstrating acceptable sampling and analytical precision.

9.0 SUMMARY AND CONCLUSIONS

Amec Foster Wheeler reviewed 173 data records from field samples during this validation. All the data generated are usable and of acceptable quality with the addition of qualifiers presented in Table 2. Qualifier definitions are summarized in Section 4.0, reason codes are summarized in Section 5.0, and qualified data are summarized below.

- Amec Foster Wheeler J qualified 40 records (23.1%) as being estimated concentrations because of hold time exceedances, or analyte concentrations between the DL and RL.

No records were rejected and 100% of the data should be considered valid with the addition of the qualifiers presented in Table 2.

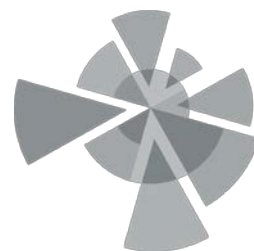
REFERENCES

Amec Foster Wheeler, 2017. Operations & Maintenance Services Sampling and Analysis Plan (SAP), Bunker Hill Central Treatment Plant Upgrade Project, Kellogg, Idaho, March 2017.

EPA, 2017. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review, EPA-540-R-2017-001.

LIMITATIONS

This report was prepared exclusively for the Bunker Hill Central Treatment Plant by Amec Foster Wheeler Environment & Infrastructure Solutions, Inc. The quality of information, conclusions, and estimates contained herein is consistent with the level of effort involved in Amec Foster Wheeler services and based on: i) information available at the time of preparation, ii) data supplied by outside sources, and iii) the assumptions, conditions, and qualifications set forth in this report. This data validation report is intended to be used by the Bunker Hill Central Treatment Plant in Kellogg, Idaho only, subject to the terms and conditions of its contract with Amec Foster Wheeler. Any other use of, or reliance on, this report by any third party is at that party's sole risk.



TABLES

TABLE 1
Field Samples Submitted to SVL Analytical, Inc.
Bunker Hill Central Treatment Plant Upgrade Program
Kellogg, Idaho

Field Sample ID	Collection Date	SVL Analytical, Inc. Sample ID	Notes
KT-05-21-15	5/21/2018	X8E0481-01	
KT-05-24-18	5/24/2018	X8E0481-02	
QC-05-24-18	5/24/2018	X8E0481-03	Field Duplicate of KT-05-24-18
KT-05-28-18	5/28/2018	X8E0653-01	
KT-05-31-18	5/31/2018	X8E0653-02	
006-06-01-18	6/1/2018	X8F0001-01	
006-06-04-18	6/4/2018	X8F0022-01	
KT-06-04-18	6/4/2018	X8F0023-01	Stage 4 Validation
KT-06-07-18	6/7/2018	X8F0023-02	Stage 4 Validation
PTM-06-07-18	6/7/2018	X8F0023-03	Stage 4 Validation
QC-06-07-18	6/7/2018	X8F0023-04	Field Duplicate of PTM-06-07-18, Stage 4 Validation
006-06-06-18	6/6/2018	X8F0082-01	
006-06-08-18	6/8/2018	X8F0169-01	
006-06-11-18	6/11/2018	X8F0209-01	
KT-06-11-18	6/11/2018	X8F0210-01	
QC-06-11-18	6/11/2018	X8F0210-02	Field Duplicate of KT-06-11-18
RB-06-11-18	6/11/2018	X8F0210-03	Equipment Blank
TB-06-11-18	6/11/2018	X8F0210-04	Trip Blank
KT-06-14-18	6/14/2018	X8F0210-05	
006-06-13-18	6/13/2018	X8F0261-01	
GWV-06-14-18	6/14/2018	X8F0342-01	
006-06-15-18	6/15/2018	X8F0342-02	
006-06-18-18	6/18/2018	X8F0377-01	
KT-06-18-18	6/18/2018	X8F0378-01	
KT-06-21-18	6/21/2018	X8F0378-02	
PTM-06-21-18	6/21/2018	X8F0378-03	
006-06-20-18	6/20/2018	X8F0430-01	
006-06-22-18	6/22/2018	X8F0513-01	
QC-06-22-18	6/22/2018	X8F0513-02	Field Duplicate of 006-06-22-18
006-06-25-18	6/25/2018	X8F0543-01	
006-06-27-18	6/27/2018	X8F0600-01	
006-06-29-18	6/29/2018	X8F0686-01	

Notes:

ID = identification

TABLE 2
Qualifiers Added During Data Validation
Bunker Hill Central Treatment Plant Upgrade Program
Kellogg, Idaho

Sample ID	Analytes	Concentrations	Qualifiers and Reason Codes
006-06-01-18	pH	6.9 SU	J HT
006-06-04-18	pH	6.9 SU	J HT
006-06-06-18	pH	6.9 SU	J HT
006-06-08-18	pH	6.9 SU	J HT
006-06-11-18	pH	6.8 SU	J HT
006-06-13-18	pH	6.7 SU	J HT
006-06-15-18	pH	6.7 SU	J HT
006-06-18-18	pH	6.9 SU	J HT
006-06-20-18	pH	6.9 SU	J HT
006-06-22-18	pH	7.3 SU	J HT
006-06-22-18	Lead	0.0032 mg/L	J DL
006-06-25-18	pH	6.8 SU	J HT
006-06-25-18	Lead	0.0045 mg/L	J DL
006-06-27-18	pH	6.8 SU	J HT
006-06-27-18	Lead	0.0036 mg/L	J DL
006-06-29-18	pH	6.8 SU	J HT
006-06-29-18	Lead	0.0037 mg/L	J DL
KT-05-21-15	pH	2.8 SU	J HT
KT-05-24-18	pH	2.7 SU	J HT
KT-05-28-18	pH	2.8 SU	J HT
KT-05-31-18	pH	2.8 SU	J HT
KT-06-04-18	pH	2.8 SU	J HT
KT-06-07-18	pH	2.7 SU	J HT
KT-06-11-18	pH	2.7 SU	J HT
KT-06-14-18	pH	2.9 SU	J HT
KT-06-18-18	pH	2.9 SU	J HT
KT-06-21-18	pH	2.9 SU	J HT
PTM-06-07-18	TSS	0.6 mg/L	J DL
PTM-06-07-18	pH	6.9 SU	J HT
PTM-06-07-18	Lead	0.0073 mg/L	J DL
PTM-06-21-18	TSS	0.2 mg/L	J DL
PTM-06-21-18	pH	7.0 SU	J HT
PTM-06-21-18	Lead	0.0072 mg/L	J DL
QC-05-24-18	pH	2.8 SU	J HT
QC-06-07-18	TSS	0.6 mg/L	J DL
QC-06-07-18	pH	6.9 SU	J HT
QC-06-07-18	Lead	0.0067 mg/L	J DL
QC-06-11-18	pH	2.7 SU	J HT
QC-06-22-18	pH	7.2 SU	J HT
QC-06-22-18	Lead	0.0027 mg/L	J DL

Notes:

mg/L = milligrams per liter

EPA = US Environmental Protection Agency

ID = Identification

SU = Standard Units

TSS = Total Suspended Solids

Qualifier Definition:

J = The analyte was positively identified; the associated numerical value is approximate.

Reason Codes:

DL = The analyte concentration is between the detection limit and the reporting limit.

HT = The EPA-recommended maximum holding time was exceeded.

TABLE 3
Field Duplicate Detections
Bunker Hill Central Treatment Plant Upgrade Program
Kellogg, Idaho

Analyte	Method	Average RL	Primary Concentration	Field Duplicate Concentration	RPD	Notes
KT-05-24-18 and QC-05-24-18						
TSS	2540D	5.0 mg/L	195	194	0.5%	
pH	4500H	SU	2.7 J	2.8 J	3.6%	
Cadmium	EPA 200.7	0.0020 mg/L	0.607	0.599	1.3%	
Lead	EPA 200.7	0.0075 mg/L	0.843	0.784	7.3%	
Manganese	EPA 200.7	0.0800 mg/L	100	98.6	1.4%	
Zinc	EPA 200.7	0.100 mg/L	230	233	1.3%	
PTM-06-07-18 and QC-06-07-18						
TSS	2540D	1.0 mg/L	0.6 J	0.6 J	0.0%	
pH	4500H	SU	6.9 J	6.9 J	0.0%	
Cadmium	EPA 200.7	0.0020 mg/L	1.3	1.28	1.6%	
Lead	EPA 200.7	0.0075 mg/L	0.0073 J	0.0067 J	8.6%	
Zinc	EPA 200.7	0.010 mg/L	11.1	10.9	1.8%	
KT-06-11-18 and QC-06-11-18						
TSS	2540D	5.00 mg/L	32.0	32.0	0.0%	
pH	4500H	SU	2.7 J	2.7 J	0.0%	
Lead	EPA 200.7	0.0075 mg/L	0.631	0.645	2.2%	
Cadmium	EPA 200.7	0.0020 mg/L	0.570	0.577	1.2%	
Manganese	EPA 200.7	0.0800 mg/L	50.9	50.9	0.0%	
Zinc	EPA 200.7	0.100 mg/L	216	223	3.2%	
006-06-22-18 and QC-06-22-18						
TSS	2540D	1.0 mg/L	1.8	1.4	25%	
pH	4500H	SU	7.3 J	7.2 J	1.4%	
Lead	EPA 200.7	0.0075 mg/L	0.0032	0.0027	17%	
Manganese	EPA 200.7	0.0080 mg/L	12.7	12.0	5.7%	
Cadmium	EPA 200.7	0.0020 mg/L	0.0074	0.0072	2.7%	
Zinc	EPA 200.7	0.010 mg/L	0.276	0.266	3.7%	

Notes:

mg/L = milligrams per liter
 SU = standard units
 EPA = US Environmental Protection Agency
 TSS = Total Suspended Solids
 RPD = relative percent difference
 RL = reporting limit

Method:

2540D = Total Suspended Solids by SM 2540D
 4500H = pH by SM 4500 H-B
 EPA 200.7 = Metals by EPA Method 200.7

Qualifiers

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample